

PART III

Physical Description

Physical Regions of Washington

On the basis of surface features, Washington may be divided into eight general regions. Agricultural settlement is influenced by factors of topography, climate, soil, forest vegetation and water resources distinctive to each of the physiographic regions. Each has become a different type of farming area as settlers have learned to adapt crops and livestock to the conditions, or have improved limitations through drainage or irrigation.

Coastal Plains

A narrow, sandy plain with shallow bays, tidal flats, stream deltas, and low headlands lies between the coastline and the Coast Range. It extends from the Columbia River mouth almost to Cape Flattery, being widest and lowest in the Grays Harbor and Willapa Bay districts. The climate is mild and damp with a long growing season, but it is too cool, cloudy and wet for most crops. Originally this area was covered with heavy forests and much is now covered with woodlands. Lumbering and manufacture of wood products is the main industry. Farming is largely of the livestock and dairying type on low uplands and drained areas in the lower Chehalis River Valley. Cranberry growing is important and well-adapted to numerous, boggy areas in the Grays Harbor and Willapa Bay sections. The shallow bays are also used for oyster culture. Fishing is common in the rivers and coastal banks.

Coast Range

The Coast Range is an uplifted area of sedimentary and metamorphic rocks divided into the Olympic Mountains and the Willapa Hills. The Olympics tower to nearly 8,000 feet in a dome-like structure, carved deeply by rivers. These mountains have the heaviest precipitation in the state. Snowfields and heavy forest cover the mountains. Most of the wilderness area is within the Olympic National Forest and Olympic National Park, being managed for recreation, wildlife and timber. Farm settlement is limited to some foothill river plains and coastal terraces such as the Dungeness and Port Angeles districts along the Strait of Juan de Fuca. Here in the lee of the mountains, rainfall is moderate and irrigation is practiced by some livestock farmers. The Willapa Hill country is wet, heavily forested and carved into numerous narrow valleys. Logging is the main industry, combined with livestock farming in the upper Chehalis River Valley and along the banks of the Columbia River. Wet climate, hilly topography and the difficulty of clearing stump land retards agriculture.

Willamette-Puget Sound Lowland

A broad lowland, described as a trough or valley, lies between the Coast Range and the Cascade Mountains. The northern part is the Puget Sound Lowland, which has been glaciated and occupied by the sea in the lowest section. The continental glacier reached slightly south of Olympia. Under a warming climate it melted and geologists believe it receded about 25,000 years ago, leaving an infertile plain of moraines and outwash gravels, sands and clays known today

as the Puget Glacial Drift Plain. Its rolling surface has numerous lakes and bogs. Most of the major cities--Seattle, Tacoma, Everett, Bellingham and Olympia--have been built on moraines bordering the Sound. Rivers, such as the Nooksack, Skagit, Snoqualmie, White and Puyallup, built up deltas and flood plains over the older gravelly plains. These narrow valleys are more fertile than the older glacial plains, and support numerous small dairy, vegetable and berry farms. Most of the gravelly areas are wooded with a second-growth forest and are used for pastures. In the southern part of the Willamette-Puget Sound Lowland, there are two large valleys--the Cowlitz and Chehalis. They drain a low, hilly area with several flat prairies and bottom lands.

Agriculture is handicapped by poor drainage and flooding of the river deltas and plains, by heavy winter rainfall, by cloudy but dry summers, by coarse, gravelly upland soils and by densely wooded land which is costly to clear. Advantages are mild climate and a location close to major markets for farm products such as milk, poultry and vegetables.

Cascade Mountains

The Cascades are a wide and high topographic and climatic barrier which separates western and eastern Washington. The range is made up of sedimentary, igneous and metamorphic rocks which have been carved by glaciers and streams. High isolated volcanic cones of lava such as Mt. Adams (12,307 feet), Mt. Rainier (14,408 feet) and Mt. Baker (10,791 feet) appear upon the older Cascade rocks. The Cascade crest varies between 10,000 and 3,000 feet and is higher and more rugged in northern Washington. Roads and railroads have been built across its lower passes in central and southern Washington. The Columbia River has cut a deep gorge and the lowest pass through the barrier. The western slope is wet and heavily forested with Douglas fir. The eastern slope is drier with a less-dense pine forest. Nearly all classified as forest land, most of the area is in Federal ownership in five national forests and Mount Rainier National Park. Tree fruit farming in the eastern slope valleys of Wenatchee, Chelan, Methow, Naches and the Columbia Gorge is most important. Sheep and cattle summer grazing on alpine grasslands is another use. Deep western slope valley bottoms such as the Skagit, Snoqualmie, Nisqually, Cowlitz and Lewis also contain livestock farms. The area is vitally important as a source of water for irrigation and city drinking water and as a source of timber. Steep terrain, wet climate, short growing seasons and heavy forest vegetation are main handicaps for agriculture.

Columbia Basin

A low plateau of old lava rocks covered with stream and wind-deposited soils extends in a series of plains, ridges, coulees and hills from the Cascade to the eastern Washington border. The area is basin-like in structure, being higher around its margins and sloping inward to low and level central plains. It has been sharply eroded by the Columbia River and its interior tributaries, the Snake, Yakima, Palouse and Spokane Rivers. The basin has sub-areas created by crustal movements and erosion.

The Yakima Folds are a series of hilly ridges extending from the Cascades eastward into the lower part of the basin. The Yakima and Columbia Rivers have cut gaps through the ridges and built up plains in the troughs between them. The rich, alluvial plain of the Yakima River is an important irrigated valley.

The Waterville Plateau is a tableland of thin soils overlaying basaltic rock at an elevation of 2,500 to 3,000 feet. It has gorges cut by the Columbia River and ancient glacial outwash streams once flowing in Moses and Grand Coulees. It is too high for irrigation and is used for dryland grain and livestock farming. The high plain is often called the Big Bend country.

The Channelled Scablands is a belt of dry terrain carved by ice-age rivers into a series of coulees. Bare rock is exposed in the coulees. Small plateaus between the old river channels have thin soils used for dryland farming. The Grand Coulee of this region has been developed into a major irrigation reservoir.

The Palouse Hills consist of fertile deposits of wind-blown soil overlaying basaltic lava flows. After being deposited in large dunes, the formation was reshaped by streams into an intricate pattern of low, rounded hills which are tilled for wheat, barley and legumes. The hills receive 16 to 25 inches of rainfall and have deep, porous and fertile soils. It is one of the richest farming areas of the Pacific Northwest.

The Central Plains are low and relatively level expanses of soil, deposited by old streams crossing the Channelled Scablands and later by the flooding of the Yakima, Columbia, Snake and Walla Walla Rivers. Climate is desert-like (6-12 inches of precipitation per year). The lower lands of the area, the Quincy and Pasco Basins and the Walla Walla Valley, are irrigated. Quincy Basin is a new irrigation area watered by Grand Coulee Dam.

Agricultural handicaps in Columbia Basin regions are mainly found in its dry, continental climate. Large irrigation systems built since 1900 have overcome much of the need for water on rich valley and basin soils. Dryland farming in higher areas is practiced widely, although occasional variations in rainfall, lack of snowfall, winter-kill, water and wind erosion inflict damage to field crops and to livestock ranges.

Okanogan Highlands

A portion of the Rocky Mountains, consisting of well-eroded old granites, lavas and sedimentary rocks, extends across north central Washington. These are the Okanogan Highlands, the state's richest mineral area. Summit levels reach 4,000 to 5,000 feet with peaks exceeding 7,000 feet. Prominent north-south valleys are occupied by irrigated tree fruit and livestock farms. These are the Okanogan, Sanpoil, Kettle and Colville Valleys. The Columbia River gorge through the Okanogan Highlands is occupied by the large man-made lake behind Grand Coulee Dam--Roosevelt Lake. High and wetter portions are forested with pine and larch, and are managed for timber and for livestock ranges by the United States Forest Service and the Bureau of Indian Affairs. Cold winter temperatures, short growing seasons, dry valley climates and distance from markets are farming handicaps.

Selkirk Mountains

The Selkirks, a range of the Rocky Mountain system, extend into the northeast corner of Washington. The rocks are old mineralized granites and metamorphics reaching elevations of over 7,000 feet. The Pend Oreille River Valley

at the base of the Selkirks is an agricultural area of narrow bottom lands settled by livestock farmers. Nearly all of the uplands are in Kaniksu National Forest. While climate is cool and growing seasons are short, the Pend Oreille Valley has an advantage of being closely located to the Spokane metropolitan market area.

Blue Mountains

The Blue Mountains are an uplifted and eroded plateau extending into the southeastern corner of Washington. The strata are mainly ancient crystalline rocks which contain some minerals. The highest point of the mountains in the Washington section is Diamond Peak (6,401 feet), on the divide between the Grande Ronde, Tucannon and Touchet Rivers. These rivers, and the Walla Walla River, have cut valleys into the plateau. Extensive pine forest and grassland areas are in the highlands within Umatilla National Forest, where rainfall is 30 to 40 inches. The Snake River has cut a deep valley and gorge across the lower parts of the mountains. The area is well developed agriculturally around its northern foothills where wind-blown soils are deep and irrigation systems are used. The Walla Walla and Tucannon Valleys are rich grain, legume and livestock areas grown under irrigation and by dry farming. Grazing is an important use of the high lands by livestock ranchers in the upper valleys.

Topography of Cowlitz County

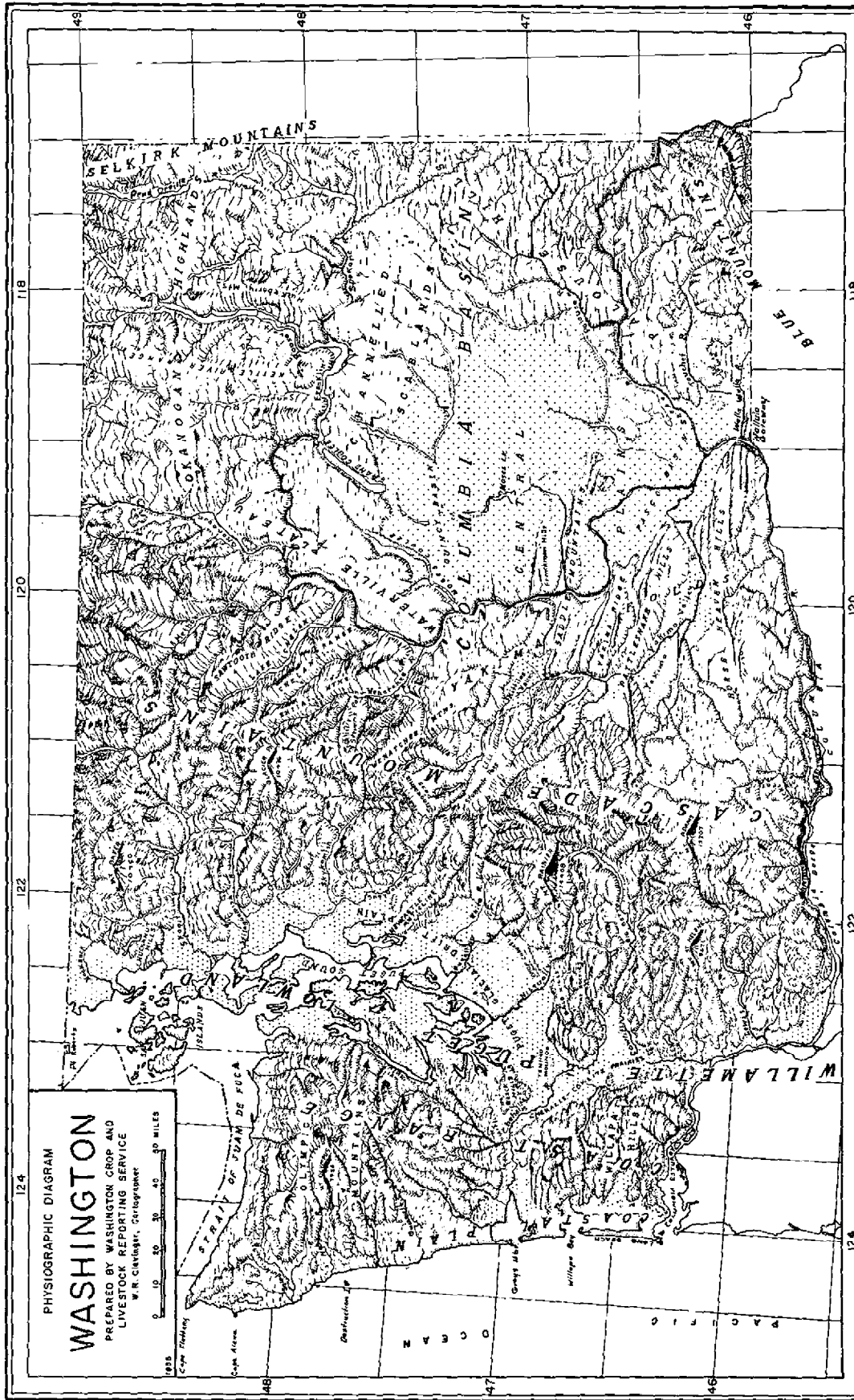
Most of Cowlitz County is hilly and mountainous. Within its boundaries are large areas of the Willapa Hills sub-region of the Coast Range and a large portion of the Cascade Mountains. Elevations vary from near sea level at tide-water on the Columbia River to points over 4,000 feet on the slopes of Mount St. Helens, which is on the county line, and its summit within Skamania County. Elk Mountain, 4,560 feet, in the Cascades, is the highest point in Cowlitz County.

The settlement pattern is essentially a river valley type. Cities, towns, farms and transportation routes conform to the narrow valleys of the Columbia River and five tributaries--the Cowlitz, Toutle, Cowlitz, Kalama and Lewis Rivers. These rivers are deeply entrenched in the Willapa and Cascade rock strata. The Columbia, Cowlitz and Lewis Rivers are meandering, deep and slow-flowing rivers, skirted by flood plain bars of flat, deep, wetland soils. Flooding is a frequent problem and the low bottom lands required ditching and diking by farmers before they became crop and pasture lands.

Land Classification and Soils

Cowlitz County land is divided into six broad classes of economic use. 1/ Class I and II lands are of high and above-average productivity and support the farms of highest income. This good farming land is limited, being found on the better-drained alluvial plains bordering the Cowlitz, Lewis and Columbia Rivers. The largest belt of Class I and II land is the delta plain of the Lewis

1/ Washington State College, Agric. Exp. Station. Economic Land Use Class
Map, Clark-Cowlitz Counties, Washington, 1945. Pullman, Washington.



GENERALIZED CROSS-SECTION ALONG 47°30'

COAST RANGE

COASTAL PLAIN

WILLAMETTE-PUGET LOWLAND

OLYMPIC MOUNTAINS

PUGET GLACIAL DRIFT PLAIN

CASCADE MOUNTAINS

COLUMBIA BASIN

WATERVILLE PLATEAU

CHANNELLED SCABLANDS

PALOUSE HILLS

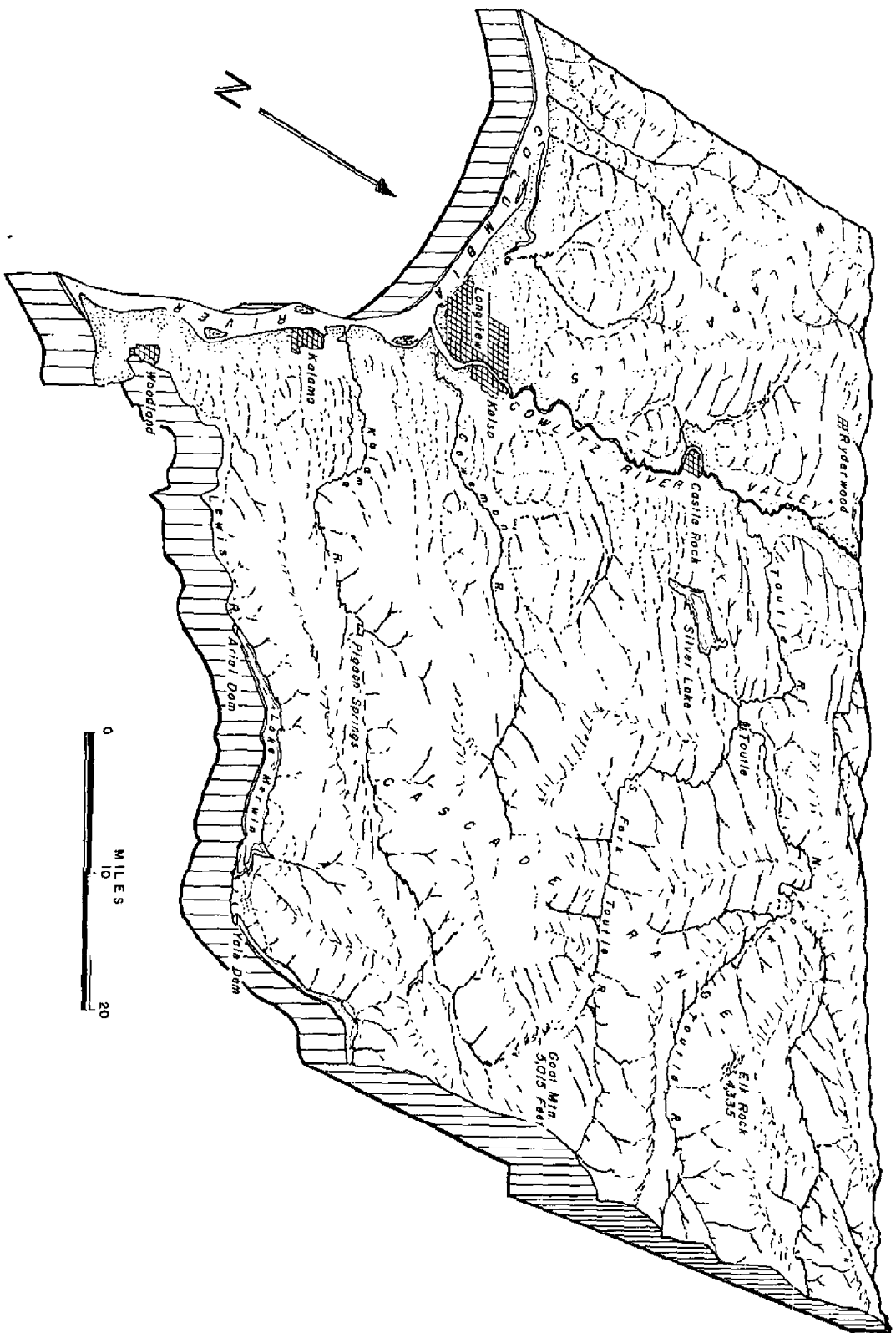
20,000 FEET

SEA LEVEL

(VERTICAL SCALE EXAGGERATED 8 TIMES)

1955

TOPOGRAPHIC DIAGRAM COWLITZ COUNTY



River at its junction with the Columbia River surrounding Woodland. Soils here are deep silty and sandy loams. Other important bottom land pockets of this most productive land surround Kelso, Longview and Castle Rock in the lower Cowlitz Valley. Much of this land is flood plain soils reclaimed by ditching and diking.

There are numerous localities of Class III, IV and V lands of fair to low productivity. These include sloping, moderately hilly areas with thin, stony and dry soils on the upper benchlands of the major rivers. The largest farmland area is classified as Class V land, which is hilly, uneven and irregular in topography. Most of it is low upland areas of the Cascade Mountains and the Coast Range inland from the level valley floor plains of the Columbia and Cowlitz Rivers. It is suited for tree crop farming, farm woodlands and permanent pastures.

Well over two-thirds of Cowlitz County is not farmed because of mountainous and heavily forested terrain. The Willapa Hills make up a large area northwest of Longview and Kelso. Eastward of the Cowlitz and Columbia River valley lowlands is a wide area of Cascade foothills and mountains. Farming is carried on in some of the narrow stream valleys of the Lewis, Kalama, Cowman and Toutle Rivers.

Climate

Cowlitz County is located in the West Coast Marine Climatic Region of North America which extends along the coast from southeastern Alaska to northern California. Climatologists describe this climate as one influenced by the mild, moist air flowing in from the oceans. Prevailing moist westerlies from the Pacific rising over the Willapa Hills and the Cascades bring cool, cloudy and wet conditions for about nine months of the year. During the summer the land is warm and the winds off the ocean do not drop moisture as frequently as in winter. Thus, there is generally a dry period during July and August with considerable sunshine to mature crops and provide good harvesting conditions for hay and grain.

The lowlands have a climate similar to other parts of the world located on the west margins of continents in the belt of the prevailing westerly winds. These include England, northwestern France, Holland, Denmark and Norway in Europe. In the southern hemisphere the same mild, cloudy and wet climate is found in southern Chile and in southern New Zealand. In world regional and commercial geography, the countries and states located in the West Coast Marine Climatic regions are noted for heavy forests which yield lumber and pulp and for livestock farms with green pastures which yield most of the world's dairy products.

Because of changes in elevation from the low Columbia, Cowlitz and Lewis River Valleys to the Willapa Hills and Cascade Mountain crests, temperatures, frost conditions and rainfall vary considerably. Weather Bureau data are limited to four locations in Cowlitz County, but they give a general pattern by which precipitation can be charted and temperature conditions estimated.

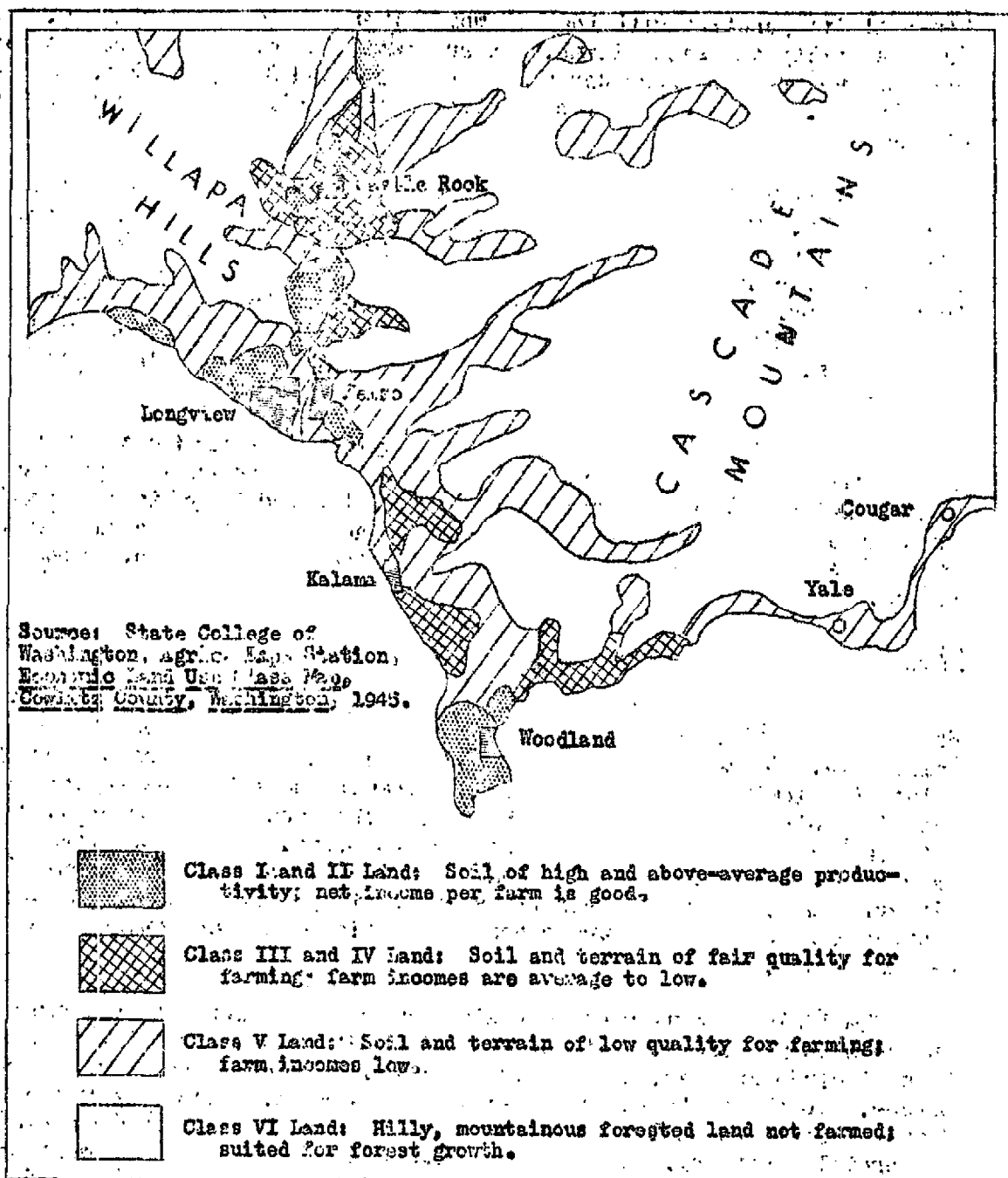


Figure 5.- General Quality of Land in Cowlitz County

Table 6.- Temperatures For Selected Stations, By Months
Cowlitz County

| Station and Elevation in Feet | Average Temperatures (in degrees Fahrenheit) | | | | | | | | | | | | Annual Average |
|-------------------------------------|---|------|------|------|------|------|------|------|-------|------|------|------|-------------------|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | |
| Kid Valley (690) | 35.3 | 40.3 | 40.5 | 46.4 | 54.0 | 55.3 | 59.6 | 60.0 | 57.2 | 49.0 | 47.1 | 38.5 | 48.6 |
| Longview (12) | 38.0 | 41.6 | 46.0 | 50.8 | 55.1 | 60.1 | 63.8 | 64.0 | 60.2 | 53.2 | 44.5 | 40.2 | 51.3 |

Source: U.S. Weather Bureau, Climatological Data,
Washington 1956

Table 7.- Temperature Extremes, Dates of Killing Frost
Cowlitz County

| Station and Elevation in Feet | Temperature Extremes Recorded (degrees Fahrenheit) | | Killing Frost Average Dates | |
|-------------------------------------|---|---------|--------------------------------|---------------|
| | Coldest | Hottest | Last in Spring | First in Fall |
| Castle Rock (80 feet) | -13 | 105 | April 1 | October 22 |
| Longview (12 feet) | -12 | 103 | March 17 | November 1 |
| Cougar (355 feet) | -3 | 104 | April 29 | October 29 |

Source: U.S. Weather Bureau, Climatological Data,
Washington 1956

Temperature records over a period of 32 years show that Cowlitz, Columbia and Lewis River bottomlands have an average of about 38 degrees in midwinter and a comfortable 60 to 64 degrees in midsummer. Temperature extremes of freezing weather and high summer readings are uncommon. Growing seasons at Longview and Castle Rock are normally 200 days free of killing frosts and freezing temperatures.

Freeze and frost conditions vary, however, from valley to valley. Bottomlands of the Toutle, Cowman, Kalama and Lewis River Valleys surrounded by Cascade Mountain ridges have late and early season frosts. These upper valleys are cooler and have shorter growing seasons.

There are three general precipitation zones in Cowlitz County. All zones, however, are humid, exceeding 40 inches and ranging 100 inches or more in the higher Cascades. A large mountainous area over which the moist westerlies are elevated and condensed into rain and snowfall during the winter months creates a damp seasonal climate.

The driest zone in the county is the lower Cowlitz Valley trough in between the two mountain systems. It is slightly in the lee of the Willapa Hills in a zone where air is descending and not precipitating moisture heavily as westerly storms pass over. Rainfall in this lowland area ranges from 40 to 50 inches. Longview with 40 inches is the driest weather station.

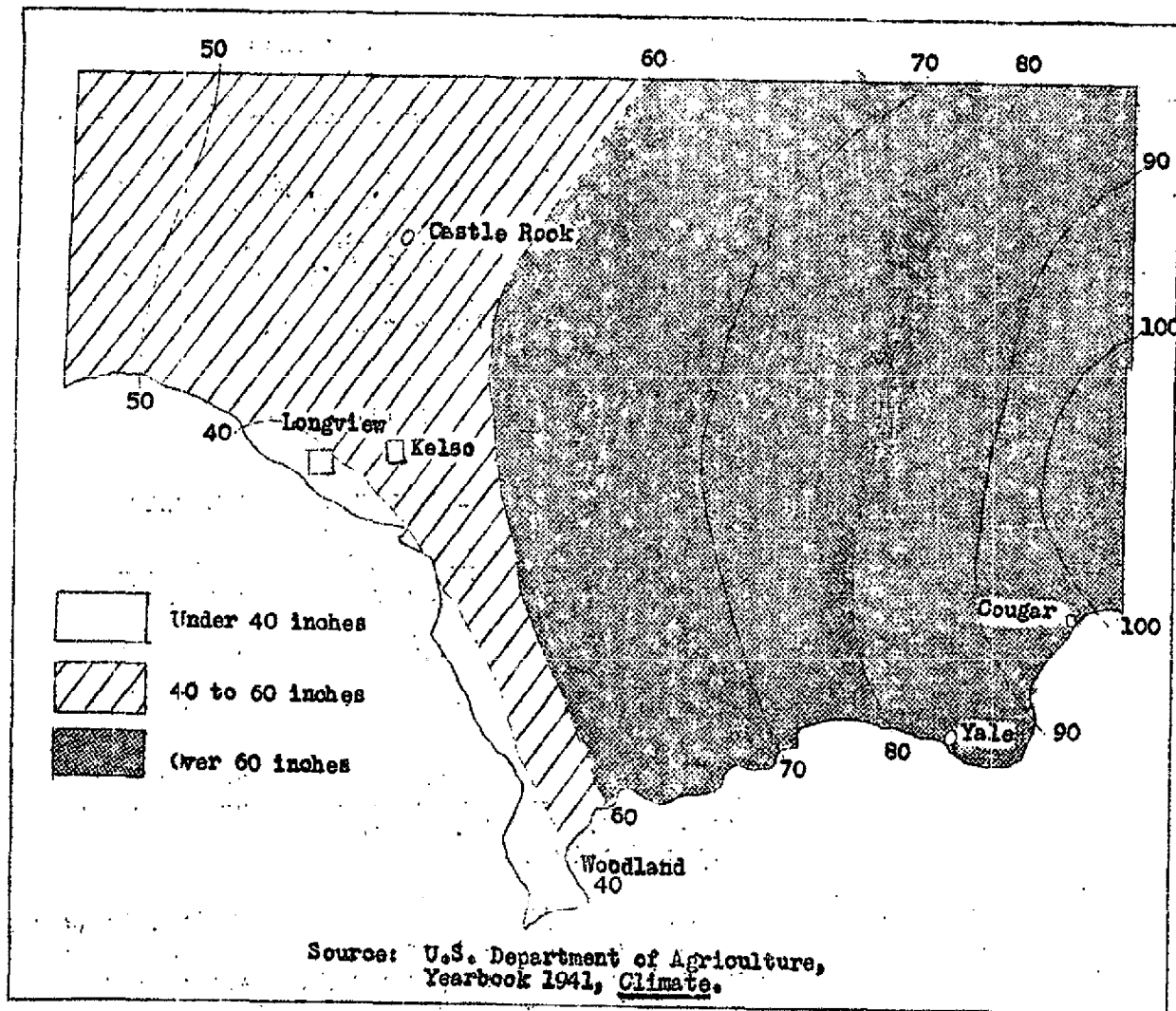


Figure 6.- Distribution of Precipitation
Cowlitz County

Table 8.- Precipitation for Selected Stations by Months
Cowlitz County

| Station and Elevation in Feet | Average Monthly Precipitation (in inches) | | | | | | | | | | | | Annual Total (inches) |
|-------------------------------------|--|------|------|------|------|------|------|------|-------|------|------|-------|-----------------------------|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | |
| Ariel Dam (224) | 8.19 | 7.97 | 7.47 | 4.24 | 2.82 | 2.84 | 1.00 | 1.14 | 2.68 | 6.43 | 9.80 | 11.51 | 66.09 |
| Kalama (900) | 9.07 | 7.51 | 7.68 | 8.05 | 3.04 | 2.97 | .77 | 1.42 | 2.95 | 5.18 | 8.03 | 11.08 | 64.15 |
| Kid Valley (690) | 15.17 | 6.51 | 5.03 | 4.82 | 3.29 | 6.03 | 1.87 | 2.67 | 1.80 | 3.53 | 6.33 | 7.06 | 64.11 |
| Longview (12) | 5.06 | 4.53 | 4.54 | 2.68 | 2.22 | 1.92 | .63 | 1.26 | 1.90 | 3.56 | 5.31 | 6.98 | 40.59 |

Source: U.S. Weather Bureau,
Climatological Data, Washington,
Annual Summary, 1954.

Two more humid zones lie within the mountains. A precipitation zone exceeding 50 inches corresponds with the Willapa Hills in western Cowlitz County. The wettest zone is the eastern half of the county made up of Cascade foothills and mountains. Winter snowfall is heavy in these highlands.

Forests and Wildlife

A coniferous forest of Douglas fir, western hemlock and western red cedar on the uplands, and woodlands of maple, alder and cottonwood in the valley bottoms once covered all of Cowlitz County. Logging, lumbering and general forestry has been and continues to be closely associated with the agricultural economy. For many years, and even today, a large number of farmers in this county have been dependent on forest industry as a supplement to their earnings from farmlands.

The forested land of Cowlitz County is very extensive. A recent Forest Service survey tabulated a total of 650,500 acres of commercial forest land with a live saw timber volume of 20,858,000,000 board feet $\frac{1}{2}$. About 90 percent of all land in Cowlitz County is classified as forest.

Forest land is mainly privately owned. Farmer-owned woodlands growing on 880 farms totals 58,000 acres or about 9 percent of all the forested land. Forests owned by timber, lumber and paper companies and by railroads in grant lands covers a vast area of about 491,000 acres, or approximately 75 percent of all Cowlitz County forest.

Public ownership amounts to 100,660 acres. State-owned acreage, primarily school grant lands, totals 76,360 acres. Federal holdings in Gifford Pinchot National Forest and Public Domain land totals 20,660 acres. Cowlitz County owns 3,640 acres in scattered tracts.

Cowlitz County has five main timber types. Douglas fir is a dominant species on 508,710 acres. Most Douglas fir is young pole timber, saplings and seedlings called regrowth or second growth. This young timber covers 259,000 acres of logged and burned-over land. There are about 113,000 acres of old growth and mature Douglas fir. Western hemlock, mountain hemlock and silver fir are dominant on 54,600 acres, mainly in the higher elevations. Western red cedar grows densely on 3,150 acres as well as mixed in with fir and hemlock over a larger area. Maple, alder, ash and cottonwood, deciduous hardwoods, grow on valley bottomlands and lower wet lands. Hardwoods are largely owned by farmers and they total over 28,000 acres. In terms of sawlog volume, timber species ready for milling rank as follows in millions of feet: Douglas fir 12,865, hemlock 3,503, silver fir 1,672, western red cedar 1,349 and hardwoods 603.

A rich forest resource and a large concentration of lumber and paper manufacturing at Longview and Kelso has recently enabled Cowlitz County to become

1/ U.S. Dept. of Agric., U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. Forest Statistics for Cowlitz County. August 1952.

a leading area in forest products industry. Much of the state's lumber industry once located on Puget Sound and Grays Harbor has shifted in the last 15 years to the Cowlitz and lower Columbia River region. Recent statistics show Cowlitz County leading all Washington counties in lumber. In 1952, sixteen lumber mills cut 587,183,000 feet or 21 percent of the state output 1/. Farmers owning woodlands are also among the leaders in the sale of pulpwood, sawlogs, poles, posts and other wood products. In the 1954 Census, Cowlitz ranked fifth in value of farm forest products sold.

Wildlife resources of forests, streams, lakes and marshland are important in the rural economy. Recent bulletins and statistical reports of the Washington State Game Commission show the importance of big game hunting, sport fishing and wild fur trapping 2/. The wildlife harvest creates income as well as recreation for rural residents. In recent years hunters have bagged about 1,400 deer and 200 elk during each season. The major rivers of Cowlitz County have yielded over 100 tons of smelt and 10,000 steelhead trout per year. The Cowlitz is the state's main smelt fishing stream and ranks fourth in steelhead. Trappers, many of them farm youths, make a fur catch of considerable value. In recent winters trappers have harvested as many commercial pelts as 1,340 muskrat, 300 mink, 275 raccoon and 40 otter for sale in the raw fur market at Seattle and St. Louis, Missouri.

1/ 1952 Statistical Year Book. West Coast Lumbermen's Association, 1410 S.W. Morrison St., Portland 5, Oregon.

2/ Game Bulletins, Washington State Game Department, 1954, 1955, 509 Fairview Ave. No., Seattle 9, Washington.